



INFLUENCE OF PHYSICO-CHEMICAL FACTORS ON THE GROWTH OF BACILLARIOPHYCEAE IN TWO LAKES OF HYDERABAD, INDIA

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ABSTRACT

The present study is an account of the influence of physico-chemical parameters on the growth and distribution of diatoms in two fresh water lakes of Himayatsagar and Osmansagar lakes. For this purpose various physico-chemical parameters were analyzed at monthly intervals (2010 – 2011). For the study of phytoplankton, samples were collected and estimated quantitatively and qualitatively. From the results it is evident that the diatoms were present very high numbers and constituted the major group of algae in both the lakes. It is vivid that there was significant influence of physico-chemical factors on the growth of bacillariophyceae members. 147 species of diatoms were recorded in both the lakes during the study period.

KEY WORDS: Physico- chemical, Diatoms and Lake.

INTRODUCTION

Due to increase in anthropogenic activities lakes are becoming victim for pollution by affecting the quality of water. To determine quality of water physico-chemical factors are important for analysis of water and also to enumerate the development of phytoplankton. Several workers have studied the ecology of fresh water algae, Satyamohan and Zafar (1986), Pradhan (2007), Ananthaiah (2010), Anand Kumar Srivastava (2010), and Nirmala (2013). The changes in physico-chemical conditions of water can be reflected directly in the biotic community of ecosystem. The study of algae gives the occurrence, distribution of different phytoplankton in a habitat. Many physico-chemical factors are responsible for the distribution and periodicity of algae. Various factors and its interrelationships play significant role to determine nutrient value for the development of algae. The present study was aimed at the influence of various physico-chemical parameters on the density of diatoms population in both the lakes.

MATERIAL AND METHODS

From the lakes surface water samples were collected for analysis using one litre capacity plastic bottle at monthly interval for a period of two years. Different physico-chemical parameters were analyzed following the Standard Methods. (APHA 1995). For phytoplankton study sedimentation column was made after adding 2-3 ml of 4% formaldehyde solution. For frequency measurement of species of algae, the drop method of Pearsal et.al (1946) was followed.

RESULTS AND DISCUSSIONS

The average values of various physico-chemical parameters were incorporated in table 1 of both the lakes. From the table it is evident that the water in both the lakes was alkaline. The DO recorded high concentration in both the lakes. Organic matter, total hardness and phosphates were recorded in low concentration. The data revealed that all physico-chemical factors showed comparatively high values in Himayatsagar. The important factors considered are calcium, dissolved oxygen and low temperature and silicates. In the present study the lakes showed high species diversity due to influence of high calcium concentration favors the growth of diatom species, (Ying Ouyang 2005). D.O was found to be positively related with Bacillariophyceae, the number of species decreased with the decrease of DO (Jayashree Rout, 2009). Temperature is found inversely proportional to diatom number, well known that diatoms prefer low temperature, (Sudha Rani 2004). The behavior of diatoms towards silicates was quite high, (Ananthaiah 2010). The prominent seasonal variation in diatom diversity, clearly depicting highest number of diatoms in winter, (Bhoyar and Tamloorkar 2012). The highest peaks during winter were mainly due to species of *Cymbella* and *Navicula* and were present throughout the period of investigation in both the lakes.

Both the water bodies supported the high number of diatoms (Table.2) but have varied amounts of DO, silicates, temperature. In Himayatsagar DO was 8.8mg/L, temperature 27.2°c and silicates 2.6 mg/L and hence showed high species diversity. Low temperature 26.2°c and low silicates 1.0mg/L showed dense diatom population in Osmansagar lake. In Himayatsagar lake dissolved oxygen was 8.8mg/L and diatom population was 8780org/ml. Osmansagar lake DO content was 6.7mg/L diatom population was 9710rg/ml. This clearly shows that the species composition is different from the two lakes. (Mahadev, et al.2009). Low nitrates, organic matter and phosphates are also considered to be important parameters on the growth of diatoms.

Four groups of algae were recorded in both the lakes among the four groups Bacillariophyceae members were predominant and constituted the major group

of algae in both the lakes. The species of *Melosira*, *Synedra*, *Navicula* and *Cyclotella* were very common in Himayatsagar lake in the presence of high nitrate concentration in water (2-3 mg/l) compared to Osmansagar lake. The species of diatoms seems to definitely prefer calcium. Presence of high calcium in both the lakes supported by the growth of *Achnanthes*, *Gomphonema*, *Cymbella* and *Navicula* species. Temperature is other factor which showed influence on the growth of *Melosira* as they are dominant in Himayatsagar lake in late summer. Various species of *Melosira* and *Gomphonema* are found under wide range of pH conditions. Presence of *Nitzschia* in lakes is found as they utilized nitrates as sources of nitrogen. Low temperature, silicates and high D.O supported the growth of *Cymbella* species. As various *Cymbella* species were predominant during winter.

The distribution of diatoms in both the lakes were made up of *Cyclotella*, *Synedra*, *Cymbella*, *Amphora*, *Surirella*, *Navicula*, *Gyrosigma*, *Gomphonema*, *Raphalodia*, *Nitzschia* and *Mastogilia* species. Species like *Melosira granulata*, *Synedra ulna*, *Caloneis clevei*, *C. silicula*, *Pinnularia biceps*, *Mastogloia lanceolata*, *M. Smithii*, *Diploneis ovalis*, *Gyrosigma acuminatum*, *G. attenuatum*, *Anomoeneissphaerophora*, *Navicula rhyncocephala*, *N. radios*, *N. cryptocephala*, *N. viridula*, *Cymbella affinis*, *Cymbella cymbiformis*, *C. turgida*, *Gomphonema lanceolatum*, *Gomphonema intricatum*, *G. montanum*, *G. gracile*, *Rhopalodia parallela* and *Rhopalodia gibba* were the dominant species and were more in number during winter months (Fig.1). In comparison with Osmansagar, Himayatsagar lake harbored more species diversity. Dominant species in both the lakes are vice versa.

The species of *Cymbella*, *Mastogloia*, *Rhopalodia*, *Gyrosigma* and *Amphora* indicates the oligotrophic nature of the lakes and it can be used as good indicators of water quality.

CONCLUSION

From the above investigation, it can be concluded that the various physicochemical parameters influence the distribution of diatoms. High calcium, dissolved oxygen and low temperature and silicates were important parameters for the growth of diatoms.

Table 1: Average values of Physico-chemical Parameters

Parameters	Osmansagar Lake	Himayatsagar Lake
Temperature	26.2	27.2
pH	8.3	8.7
CO_3^{2-}	21.8	26.9
HCO_3^-	168.3	179.7
Cl^-	131.3	143.3
D.O	6.7	8.8
BOD	4.2	2.7
Organic Matter	1.6	1.28
Total Hardness	163.9	142
Ca^{2+}	44.8	37.9
Mg^{2+}	17	12.7
PO_4^{3-}	1.1	0.9
SiO_2	1	2.61
NO_3^-	1.3	2.74
SO_4^{2-}	18.7	28

(All Physico-chemical parameters are mg/L except temperature and pH)

Table 2: Distribution of Diatoms (monthly occurrence)

Months	Osmansagar Lake	Himayatsagar Lake
	July 2010-December2011	July 2010-December2011
Jul-10	412	278
Aug-10	111	906
Sep-10	72	690
Oct-10	75	708
Nov-10	237	483
Dec-10	1777	991
Jan-11	4208	2133
Feb-11	1849	1193
Mar-11	4667	494
Apr-11	422	398
May-11	129	272
Jun-11	193	229
Jul-11	420	240
Aug-11	178	1100
Sep-11	204	1000
Oct-11	234	1230
Nov-11	585	1275
Dec-11	1703	2178
Total organisms	17476	15798
Average	971	878
Total organisms	971	878

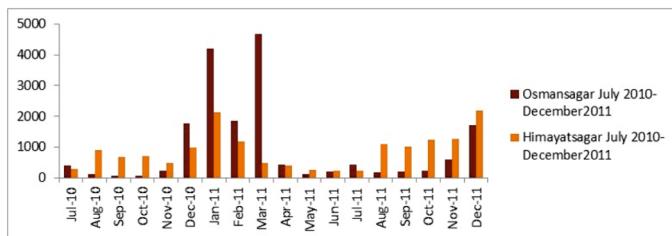


Fig 1: Distribution of various species of Diatoms in both lakes Of Hyderabad

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